



Evaluation of cow's milk production in the beginning of the rainy season in the peri-urban area of Dikodougou (Côte d'Ivoire)

Soro Soronikpoho¹, Kouadio Kouakou Parfait¹, Zouh Bi Zahouli Faustin², Brou Gboko Konan Gatién¹, Konan Koffi Mathurin¹

¹ Department of Animal Science, Laboratory of Biology and Animal Health, Agropastoral Management Institute, Peleforo Gon Coulibaly University, Korhogo, Côte d'Ivoire

² Ecology Research Center, Terrestrial Environments Laboratory, Nangui Abrogoua University, 08 BP 109 Abidjan 08, Côte d'Ivoire

Abstract

This study was conducted in the commune of Dikodougou on 17 cattle farms in order to identify the current situation of milk production in the area. To reach this objective, a field survey was first conducted and then data collection was done. The results showed that 47.06% of breeders are of Ivorian nationality, 41.18% of Malian nationality and 11.76% of Burkinabe nationality. The Fulani are the most numerous and their main activity is animal husbandry. The majority of its breeders are illiterate and only a small proportion are educated. Virtually all breeders use night pens but do not use breeding equipment. The herd was made up of Zebu Gobra, Goudali and Métis and was essentially made up of cows at 44.32%. The feeding system used by the majority (94.12%) is natural grazing with 5.88% of farmers providing a supplement. Animals are watered in the rivers. The total production of milk produced over the two months was 7,529.75 l and the average daily production obtained was 1.02 l/cow. This study made it possible to highlight the characteristics of cattle farms and their low level of production in the Sub-prefecture of Dikodougou.

Keywords: Cattle, milk, production, socio-demographic profile, Côte d'Ivoire

Introduction

Dairy farming is a sector with a strong socio-economic impact. According to figures published by the International Dairy Federation (IDF), world milk production amounted to 864 million tonnes (Mt) in 2018 with only 51.84 Mt (6%) for Africa. A large part of world production, precisely 704 Mt (81%), consisted of cow's milk, 126 Mt (15%) of buffalo's milk and the remaining 34 Mt (4%) of goat's milk, sheep and other species (Ricardo, 2020) [13].

In Côte d'Ivoire, livestock farming still remains a secondary economic activity with a contribution of around 4.5% to agricultural Gross Domestic Product (GDP) and 2% to total GDP (FAO, 2016). However, it is a developing economic activity. Animal production certainly does not guarantee the nutritional security of populations, but it also provides significant income through trade. Milk production, estimated at 34,000 tonnes in 2019 for a consumption of around 240,000 tonnes, is essentially traditional. The deficit of milk and dairy products is a permanent problem in Côte d'Ivoire. Its national production covers only 17% of the consumption of milk and dairy products (MIRAH, 2012). Thus, in order to meet its ever-increasing needs for milk and derived products, the Ivorian government has opted for the development of the local milk sector (Gbodjo *et al.*, 2013) [8] with the aim of reducing its dependence on milk and bovine protein vis-à-vis Sahelian and European countries (Boutonnet *et al.*, 2007), which dependence gives rise to products that often do not comply with health requirements. Faced with this situation, the Ministry of Animal and Fisheries Resources has put in place a national strategy action plan for developing milk value chain in Côte d'Ivoire. The effects induced by the implementation of this plan aim

to increase local production of local milk by 25% over the next 10 years, to process 50% of national local production under standard hygiene and quality conditions and to create 30,000 direct and indirect jobs.

However, this development process seems not to take into account some basic technical parameters at the level of local beef farms in order to guarantee better production. Indeed, as much as cattle breeders hardly make feeding, hygiene and training a priority, it should also be emphasized that few studies have been carried out until now on the knowledge of production parameters in cattle farms in Côte d'Ivoire. The general objective of this study is to contribute to improving the performance of cow's milk production in the commune of Dikodougou.

Material and methods

1. Material

1.1 Biological material

The biological material consisted mainly of cows from the 17 farms in the commune of Dikodougou.

1.2 Target population

This survey focused on breeders and sometimes herdsmen who take care of animal welfare in order to monitoring the daily milk production of animals.

1.3 Technical material

The technical material consisted of survey sheets to collect information on socio-demographic profile of farmers, characteristics of the farms and milk production, milk collection sheets, cans (4 liters, 1.5 liters and 2 liters), 250 and 500 ml cups.

2. Methods

2.1 Interviews

Various interviews were carried out with resource persons in order to gather as much information as possible. These are the Sub-Prefect of Dikodougou who provided the necessary information on the monograph of Dikodougou, the Departmental Director of Animal and Fisheries Resources of the Department of Dikodougou who facilitated contact with breeders and finally breeders or farm managers who collaborated by providing necessary and essential information for this study.

2.2 Collection of data

2.2.1 Pre-survey and survey

Before starting the survey, it was necessary to proceed with pre-survey in order to select the farms concerning by our study. It took place within Dikodougou Sub-prefecture in the North of Côte d'Ivoire. This phase took place from May 9 to 13, 2022 in several suburbs of Dikodougou city such as Kadjolobougou, Koko, Civil servant, Millionaire, Lagaviara and SODEPRA. This test help us to improve undertunding questions that were poorly worded. After the pre-survey, 17 farms, with at least three suckler cows in the herd and located in the city of Dikodougou were selected.

Then survey was conducted using a questionnaire including closed and open questions. For 2 months, from May 16 to July 16, 2022, the survey was conducted among 17 farms selected after the pre-survey. The questionnaire was administered in the form of a direct interview. It also made it possible to better understand the difficulties encountered in cattle breeding and milk production in this area.

2.2.2 Milk potential assessment method

Milk production was evaluated on the one hand through the data collected with the questionnaires but also daily during the entire period of the internship. Thus, on each farm, empty water cans of 1.5 and 2 liters, cups of 250 and 500 ml were given to breeders to help them estimate the quantities of milk milked. A sheet was also given to them to record the data. It was necessary to subdivide all the farms into 2 subgroups to better monitor the milking that takes place every day in the morning and to better assess the quantity of milk produced. The visits were made every 2 days given the distances between the different farms.

2.3 Data analysis

At the end of the survey, a manual count was carried out for all the questionnaires used during the surveys. This exhaustive work made it possible to obtain data relating to the socio-demographic profiles of cattle breeders, the characteristics of the farms and the milk production of the area. Microsoft Excel 2016 software was used to process the data and to produce the graphs.

Results

1. Socio-demographic profile of breeders

The table 1 presente the socio-demographic profile of breeders. The survey revealed that cattle breeding in the commune of Dikodougou is practiced mainly by foreigners

(52.54 %) of various nationalities (including 41.18 % Malians and 11.76% Burkinabés), with a significant proportion (47.06 %) of Ivorians. The Peulh is the dominant ethnic group of herders (58.82%), followed by the Sénoufos (23.53 %) and finally the Malinkés who are in a minority proportion (17.65 %). The main activity of breeders in this area is livestock breeding. The majority of these breeders practice only breeding (58.82 %) and some in addition to breeding practice either agriculture (23.53 %), trade (11.76 %) or transportation (5.89 %). The level of education of breeders in this area is relatively low. The results of the survey show that 82.35 % of the workforce are illiterate, compared to 17.65 % who have studied.

Table 1: Socio-demographic profile of breeders

	Parameters	Pourcentage (%)
Nationalité	Ivorian	47.06
	Malian	41.18
	Burkinabe	11.76
Ethnic group	Senoufo	23.53
	Malinke	17.65
	Peulh	58.82
Status of breeders	Breeding only	58.82
	Livestock + Agriculture	23.53
	Breeding + trade	11.76
	Breeding + transportation	5.89
Level of study	Illetrate	82.35
	Primary	17.65

1.2 Farms characteristics

The survey in the seventeen (17) farms visited in the Sub-prefecture of Dikodougou made it possible to identify two (02) types of cattle phenotypes, namely Zebus (Gobra and Goudali) and Métis. The majority of the livestock in the Sub-prefecture is made up of Zebus Gobra (82.35 %), followed by Zebus Goudali (11.76 %) and a minority proportion (5.88 %) of other breeds. Livestock numbers differed from farm to farm. The majority of breeders (52.94 %) had a workforce of between 31 and 60 heads. Only 23.53 % have a population of between 61 and 90 heads (Figure 6). The cattle herd was mainly composed of cows (44.32 %); calves under mothers (16.54 %); heifers (15.44 %); female calf (9.81 %); young bulls (9.48 %) and bulls (4.41 %).

Almost all the breeders surveyed (94.12 %) use night pens for housing animals in the evenings and only a tiny proportion (5.88 %) use modern pens. The majority of farmers (94.12 %) use natural pasture as staple food and a minority (5.88 %) use hay all year round. A food supplement is provided by the minority of breeders (35.29 %). For mineral-vitamin supplements, all breeders use salt (NaCl). On the other hand, a certain number of breeders (64.71 %) affirm that they do not provide a food supplement. The feeding system used by the majority of breeders (94.12 %) is the natural fodder course and only 5.88 % use zero grazing feed. The animals are taken to pasture every morning from 5 a.m. to 9 a.m. and evenings from 1 p.m. to 7 p.m. and do not return until nightfall. Among the farms visited during our survey, 94.12 % of breeders water their herds in rivers and only 5.88 % use traditional well water for watering their herds.

Table 2: Farms characteristics

Parameters	Pourcentage (%)	
Breeds bred	Zebu Gougali	11.76
	Zebu Gobra	82.35
	Metis	5.88
Livestock composition	1-30 cattles	17.65
	31-60 cattles	52.94
	61-90 cattles	23.53
	91-120 cattles	5.88
Animals number	Bulls	4
	Cows	44
	Calves under mothers	17
	Female calf	10
	Heifers	15
Infrastructures	Young bulls	10
	Traditional night park	94.12
Staple food	Modern park	5.88
	Natural pasture	94,12
Complementary food	Hay	5,88
	Complement	35,29
Feed system	No supplement	64,71
	Natural	94,12
Water source	Artificial food	5,88
	River	94,12
	Well	5,88

1.3 Milk production on farms

1.3.1 Average amount of weekly milk produced

From the first week to the sixth of the study, an almost constant average production oscillating between 111.83 ± 2.56 and 140.96 ± 2.75 l of milk was collected per week on

all farms. The highest production (140.96 ± 2.75 l) was obtained at the second week. A decrease was observed from the seventh week to the eighth week with 129.03 ± 3.18 and 111.83 ± 2.56 l respectively (Figure 1).

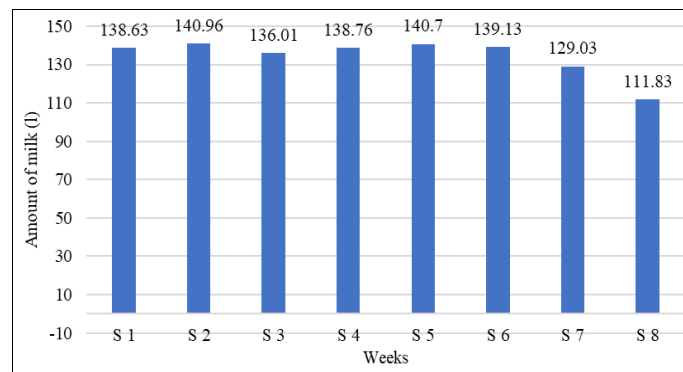


Fig 1: Average weekly quantity of milk over two months

1.3.2 Total quantity of milk produced per farm

The quantity total of milk collected during the two months in the 17 farms amounts to 7 529.75 l. Milk production varied from one farm to another throughout the collection period and is between 187 l and 915.5 l. Indeed, the greatest

production was observed in D. Oumar farm (915.5 l), followed by Bakary farm (705.5 l) and the smallest production was observed in farm of F Abdoulaye which is 187 l (Figure 2).

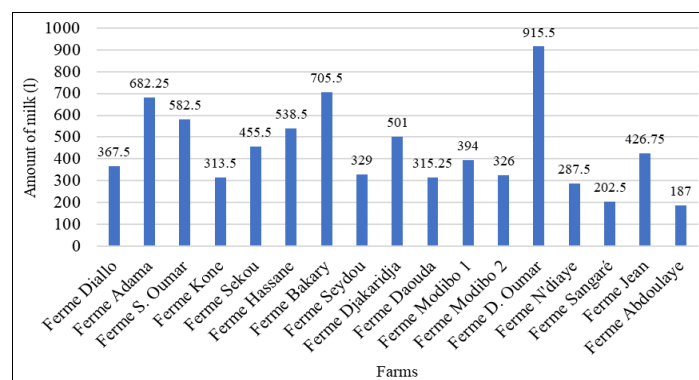


Fig 2: Total quantity of milk produced per farm over the two months

1.3.3 Average amount of milk produced per cow

Figure 3 represents the average daily milk production per cow in the commune of Dikodougou. There is a variation in the quantity of milk produced per cow from one farm to another with the average daily production varying from 0.53

± 0.8 l to 1.98 ± 2.92 l per cow. The greatest production is observed in the Adama farm with a production of 1.98 ± 2.92 l per cow, followed by the Bakary farms (1.41 ± 2.16 l) and Sekou (1.35 ± 2.03 l).

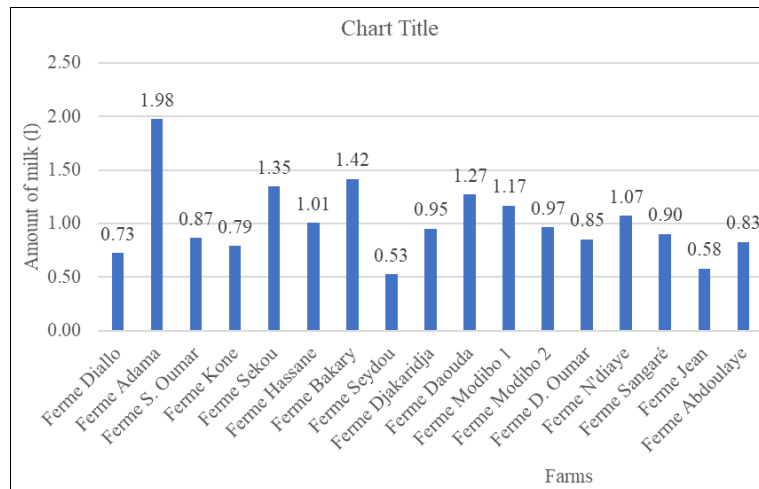


Fig 3: Average daily quantity of milk produced per cow per farm

Farms breakdown by mode of marketing

Majority of breeders questioned (64.71%) affirm that the marketing of milk is done in detail and the price per liter is 300 FCFA (in the rainy season) with a non-negligible number of breeders (35.29%) who market the milk at the wholesale price of 250 FCFA per litre. Among the latter, the marketing of milk takes place on farm just after milking, while retail sellers do so at their homes (Table I). Milk is generally transported by motorbike (70.59%) by

producers. They sell their milk to resellers and sellers of derivative products, which represent respectively 58.33% and 41.67%. In the latter, the milk does not undergo any treatment and is stored in cans just after milking. On the other hand, a number of breeders (29.41%) transport milk on foot across the city. In this type of transport, the milk undergoes heat treatment (heating) after milking and is put into calabashes for sale to customers (households) (Table II).

Table 2: Milk marketing

		Proportion (%)
Method of marketing milk	Detail	64,71
	Wholesale	35,29
Means of transport	Motorbike	70,59
	Feet	29,41
Clients	Resellers	41,67
	Sellers of dairy products	29,41
	Households	29,41
Traitements	Refrigeration	0
	Heater	29,41
	None	70,59
Conservation utensils	Canisters	70,59
	Calabash	29,41
	Tank	0

Discussion

This study conducted in the commune of Dikodougou made it possible to understand the production system of cattle and to evaluate their milk production. The survey showed that the Peulh ethnic group is the most dominant ethnic group (58.82 %) in this activity. Indeed, this high proportion of Fulani could be explained by the fact that livestock breeding is an activity that is transmitted from generation to generation within this ethnic group. However, the main activity of the natives is agriculture. The same observation was made by Toko (2016). According to this author, the farmers entrusted their cattle to the Peulh and this around a breeding contract. Livestock breeding is the activity most practiced by the inhabitants of the commune of

Dikodougou. This could be explained by the fact that these inhabitants have land, but also by the fact that livestock farming is a means of hoarding agricultural income. Our results are different from those of Soro *et al.* (2015) who state that the majority of herders practice both agriculture and animal husbandry. Also, almost all breeders are illiterate (82.35 %) with only 17.65 % of breeders having a primary level education. This could be explained by the fact that these breeders find in breeding a financial base that does not necessarily require a level of education. Our results are similar to those of N'Diaye (2006) [11] who found, in Senegal during his study, that majority (52 %) of breeders were illiterate against 48% who had studied.

With regard to the characteristics of the farms, the majority (94.12 %) of the breeders use the night pens. This could be explained by the fact that they raise their animals in a traditional way. This type of breeding leads to straying before overnight penning. The latter use small areas for night pens, which could be explained by the small size of their herds, whose numbers range from 01 to 120 head. Our results are different from those found by Assani (2013) [2] who finds areas of four (04) hectares used by breeders during his study. The dominance of Zebus in farms in the study area could be explained by their good meat potential and their large formats. The presence of other breeds, although a minority, would indicate a willingness of breeders oriented towards dairy production. These results are contrary to those observed by Sokouri *et al.* (2009) [14] who claim that Zebus are the least numerous in the North region and represent only 08 % of the herd.

The average number obtained is 54 heads. This number is similar to those found by Savadogo (2017) during his work in Burkina Faso. This could be justified by the fact that the two study areas belong to the same agroecological zone, the Sudanese zone. Also, cattles constitute savings that can be mobilized in case of need. Similar results have been reported by Zampaligre *et al.* (2019) [12] who estimate that in Sub-Saharan Africa, the average herd size varies between 15 and 157 head. Thus, the high proportion of cows (44.32 %) could be explained by the fact that cows play a major role in the herd. Indeed, they have the capacity to produce calves, milk, meat or the labor force of the herd with a monetary value for the breeder.

Feeding is the key to the success of any dairy farm. Thus, in our study, the majority of herders use natural pasture as their staple food. This could be explained by the fact that in the (extensive) village system the cattle herds are mainly fed on natural pasture. However, grazing as the only way of feeding livestock is one of the pillars of the profitability of this system. This mode of feeding is similar to that observed by Silue *et al.* (2014) [9]. Also, most breeders do not provide food supplements to animals. This could be explained on the one hand by the lack of financial means and the high cost of food supplements. On the other hand, milk production not being an objective for its owners, the meadows, in addition to their free benefits, would just serve to cover the needs of the animals. Nevertheless, the minority of owners using a supplement made up of rice bran, maize, cottonseed meal and crop residues could be considered as a start of intensification. In addition, the majority of herders water their herds in the rivers which dry up during the dry season. These results are similar to the system described by Chayer (2021) [3]. The collection of milk in cans is a characteristic of all breeders (collectors) in this area. This mode of packaging is not without consequence on the state of the milk. During transport some natural factors can influence the state of the milk, in particular the heat which can accelerate the process of fermentation of the milk. Indeed, during the transport of the milk, from the farms to the places of distribution, the milk packaged in the cans is exposed to the sun's rays. This method of collection is similar to that described by Broutin and Goudiaby (2021) [5]. The prices practiced in the city center of the study area are slightly higher than the purchase prices at the farm. This could be explained by urbanization and in particular the double profit to be made by resellers. Indeed, this artisanal collection and distribution system corresponds to that described by

Corniaux *et al.* (2007) [4], who mention constraints due to transport cost and time.

With regard to milk production, the difference between the quantities of milk produced on the farms would be explained by the size of the herds. Indeed, the farm of D. Oumar has the largest number of suckler cows which is 19 heads and that of Abdoulaye had the smallest number which was 04 suckler cows. Thus, the average daily production of 1.02 l/cow is higher than that obtained by Coulibaly (2008) [6] which is 0.88 l/cow, for the same season (rainy season) in Mali. Similarly, a variation in the quantity of milk produced per cow, from one farm to another, was observed (0.53 to 1.98 l/cow). This difference may be due to the type of animals reared. However, our results are similar to those of Akaffou (2013) [1]. This author obtained daily quantities varying between 1.5 and 2 l/cow for the same rainy season in the north of Côte d'Ivoire. These results could reflect a better performance of local breeds if the appropriate breeding conditions are respected and put into practice.

Conclusion

At the end of this study, it appears that the commune of Dikodougou, despite its pastoral potential, has a low milk production. The livestock sector is dominated by foreigners of various nationalities. However, the Fulani are the dominant ethnic group and they are generally illiterate. In this area, the most breeders use night pens and do not use breeding equipment. The Zebu breed is the highest breed in the area. It should also be remembered that the cattle herd in the area was mainly made up of cows. Livestock farming remains in this area based on the traditional system.

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